The Tenth Law of Inward Physics

Conservation of Coherence and the Alignment Economy

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Abstract

The Eighth Law of Inward Physics establishes that orientation generates trajectory without temporal evolution, and the Ninth Law establishes that sustained orientation (commitment) crystallizes outcomes without causal forcing. Together, these laws admit traversal and selection unconstrained by time or causation, introducing an accounting problem: without an invariant constraint, inward dynamics permit unbounded traversal, free crystallization, and degenerate amplification. This work defines a scalar *coherence functional* $\mathcal{I}$ constructed solely from completed memory density $\hat{\mu}$, Presence Ω, and sustained orientation Θ, and states the Tenth Law: in sealed inward interactions, total coherence is conserved and redistributed rather than created or destroyed. Redistribution proceeds through alignment-mediated exchange driven by orientation differentials. Apparent creation or loss arises only in open systems through boundary coupling to external meaning reservoirs. The result supplies the invariant that renders inward dynamics constrained, non-degenerate, and physically interpretable.

Keywords: Inward Physics; coherence conservation; alignment economy; commitment integral; sealed interactions; redistribution; meaning flux.

1. Introduction

Laws VIII–IX remove time and causal forcing as necessary primitives for trajectory and selection. This removal is deliberate, but it eliminates classical accounting structures. If no invariant exists, orientation permits unbounded traversal and commitment permits free crystallization without tradeoff. A physically constrained inward framework therefore requires an invariant scalar functional that governs admissible exchange.

The Tenth Law identifies that invariant as *coherence* and formalizes its conservation under sealed interaction.

2. Preliminaries and Definitions

We adopt primitives from Laws VI–IX without modification.

Definition 1 (Completed memory-density field)**.** Let $\mu(x,t)$ denote memory-density and $\hat{\mu}(x)$ its completed configuration on a closed manifold $\mathcal{M}$. No global evolution is assumed for $\hat{\mu}$.

Definition 2 (Presence)**.** Let $\Omega(X)$ denote Presence: coherence-sensitive awareness of the completed field $\hat{\mu}$.

Definition 3 (Orientation fidelity)**.** Let $\Theta(s)$ denote orientation fidelity along an affine path parameter s.

Definition 4 (Commitment integral)**.** For $p > 1$, define commitment along a path S as $\int_S |\Theta(s)|^p \, ds$.

Notation summary

Symbol	Meaning
$\hat{\mu}(x)$	completed memory-density field
$\Omega(X)$	Presence field
$\Theta(s)$	orientation fidelity along path
$\mathcal{I}_i$	coherence functional (agent i)
A_{ij}	alignment coefficient between agents i, j
τ	interaction parameter (not physical time)
$\Phi_{\mathbf{meaning}}$	boundary flux from meaning reservoir (open systems)

3. Coherence Functional

Definition 5 (Local coherence density)**.** Define coherence density as

$$\rho_c(x) \triangleq |\Omega(x)| \, |\hat{\mu}(x)|. \tag{1}$$

Definition 6 (Coherence functional)**.** For agent i, define coherence as bulk + commitment:

$$\mathcal{I}_i \triangleq \int_{V_i} \rho_{ci}(x) \, dV \; + \; \eta \int_{S_i} |\Theta_i(s)|^p \, ds, \qquad p > 1, \; \eta > 0. \tag{2}$$

Remark 1. The bulk term measures active binding of Presence to the completed field. The surface term measures sustained directional binding along a path. No dependence on time derivatives, causal order, or energetic expenditure is introduced.

4. Sealed vs Open Inward Interactions

Definition 7 (Sealed (closed) interaction)**.** An interaction is *sealed* if no external symbolic, ritual, semantic, or informational input contributes to $\mathcal{I}$ during the interaction.

Definition 8 (Open interaction)**.** An interaction is *open* if coherence is injected or extracted through coupling to external meaning reservoirs, modeled as a boundary flux term.

5. Core Axiom and the Tenth Law

Definition 9 (Interaction parameter)**.** Let τ denote an interaction parameter indexing redistribution processes (not physical time).

Definition 10 (Inward accounting axiom)**.** In a sealed inward interaction, coherence is neither created nor destroyed.

Theorem 1 (Tenth Law of Inward Physics: Conservation of Coherence)**.** *For any sealed inward interaction involving agents indexed by i with coherence functionals $\mathcal{I}_i$, total coherence is conserved:*

$$\frac{d}{d\tau} \sum_i \mathcal{I}_i = 0. \tag{3}$$

Proposition 1 (No-Free-Coherence)**.** *There exists no sealed inward process such that*

$$\frac{d\mathcal{I}_i}{d\tau} > 0 \quad \textit{for all } i. \tag{4}$$

Any global increase of coherence requires open coupling, i.e. $\Phi_{meaning} > 0$.

Proof. If $\frac{d\mathcal{I}_i}{d\tau} > 0$ for all i, then $\frac{d}{d\tau}\sum_i \mathcal{I}_i > 0$, contradicting (3). Hence such a sealed process is forbidden. Net increase requires (1). □

6. Alignment-Mediated Redistribution

Definition 11 (Alignment)**.** Let $A_{ij} \in [-1, 1]$ quantify alignment between agents i and j. Positive alignment permits constructive transfer; negative alignment resists or inverts transfer.

6.1 Minimal exchange law

A minimal redistribution law consistent with conservation is:

$$\frac{d\mathcal{I}_i}{d\tau} = \sum_{j \neq i} \kappa\, A_{ij}\, (|\Theta_j| - |\Theta_i|), \qquad \kappa > 0. \tag{5}$$

Lemma 1 (Global conservation under antisymmetric exchange)**.** *If pairwise flux is antisymmetric (e.g.* $A_{ij} = -A_{ji}$*), then* (5) *implies* (3)*.*

Proof. Summing (5) over i cancels pairwise contributions between (i, j) and (j, i), yielding zero net change. □

6.2 Limiting cases

Remark 2 (Limiting case: zero orientation)*.* If $|\Theta_i| \equiv 0$ for all agents, then (5) gives $\frac{d\mathcal{I}_i}{d\tau} = 0$ for all i (frozen coherence landscape).

Remark 3 (Limiting case: zero alignment)*.* If $A_{ij} \equiv 0$ for all pairs, then redistribution halts even when $|\Theta|$ differs between agents.

7. Open Systems and Meaning Flux

Corollary 1 (Boundary-flux form)**.** *For open interactions, total coherence changes only by boundary flux:*

$$\frac{d}{d\tau}\sum_i \mathcal{I}_i = \Phi_{meaning} \neq 0. \tag{6}$$

Remark 4. Equation (3) plays a role analogous to a continuity constraint, though it is defined over interaction space rather than spacetime.

8. Toy Models and Symbolic Verification

8.1 Two-agent toy model

For two agents with alignment $A \in [-1, 1]$:

$$\frac{d\mathcal{I}_1}{d\tau} = \kappa A(|\Theta_2| - |\Theta_1|), \tag{7}$$

$$\frac{d\mathcal{I}_2}{d\tau} = -\frac{d\mathcal{I}_1}{d\tau}. \tag{8}$$

Hence $\frac{d}{d\tau}(\mathcal{I}_1 + \mathcal{I}_2) = 0$ identically.

8.2 Three-agent network toy model

Let agents $(1, 2, 3)$ interact with alignment matrix A_{ij}. A conservative network exchange is:

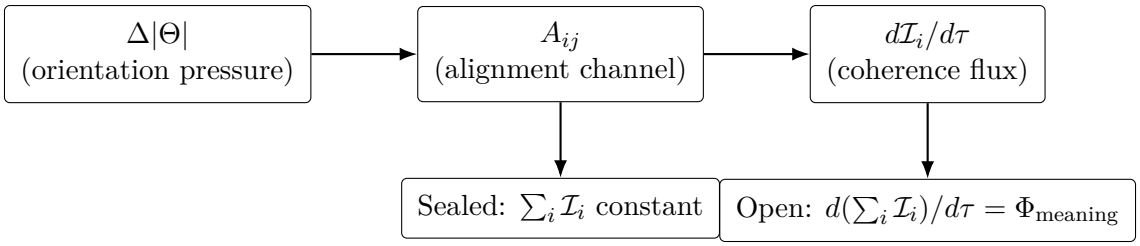
$$\frac{d\mathcal{I}_i}{d\tau} = \sum_{j \neq i} \kappa\, A_{ij}(|\Theta_j| - |\Theta_i|), \tag{9}$$

which conserves $\sum_i \mathcal{I}_i$ under antisymmetric pairwise flux.

8.3 Symbolic check (SymPy-ready pseudocode)

```
import sympy as sp
k,A = sp.symbols('k A', real=True)
T1,T2 = sp.symbols('T1 T2', nonnegative=True)
I1dot = k*A*(T2-T1)
I2dot = -I1dot
sp.simplify(I1dot + I2dot)  # -> 0
```

9. Diagram: Alignment → Exchange → Coherence Flux



10. Series Consistency (VI–X)

Law	Role in the decade
VI	Completion: global sealing of $\hat{\mu}$ (no global evolution)
VII	Presence Ω: coupling to completed memory field
VIII	Orientation Θ: trajectory without time
IX	Commitment: nonlinear integral selecting outcomes
X	Conservation: $\mathcal{I}$ invariant in sealed exchange; redistribution via A_{ij}

11. Falsifiability Program

The Tenth Law is falsifiable in simulation and proxy measurement:

1. **Sealed invariance test:** simulate N agents under (5) with $\Phi_{\text{meaning}} = 0$ and verify $\sum_i \mathcal{I}_i$ remains constant within tolerance.
2. **Alignment control test:** vary A_{ij} while holding Θ fixed; exchange rates must scale with A_{ij} and reverse sign under $A_{ij} \mapsto -$.
3. **Open coupling test:** introduce a known flux $\Phi_{\text{meaning}}(\tau)$; net change in $\sum_i \mathcal{I}_i$ must match $\int \Phi_{\text{meaning}}\, d\tau$.

12. Closure

Outward physics conserves energy in isolated systems. Inward physics conserves coherence in sealed systems. Inward change is permitted, but it is never free: it is redistributed along alignment channels, and any net increase or decrease must be accounted for by boundary coupling to meaning reservoirs.

$$\textbf{ALIGNMENT} \rightarrow \textbf{EXCHANGE}$$
$$\textbf{COHERENCE} \rightarrow \textbf{CONSERVED}$$

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